REMARKS

By this Amendment, Applicants add new claims 23 and 24 to protect additional aspects of the invention. With claims 14-22 having been withdrawn, claims 1-13, 23, and 24 are pending.

In the Office Action mailed February 20, 2004[1], claims 1, 2, 4, 5, and 7-13 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,240,866 to *Friedman et al.* ("*Friedman*") in view of U.S. Patent No. 6,393,602 to *Atchison et al.* ("*Atchison*") and claims 3 and 6 were rejected under 35 U.S.C. § 103(a) as being unpatentable over *Friedman* in view of *Atchison* and further in view of the document entitled "Discrimination of Clustered Defects on Wafers Using Statistical Methods," ("*Ikota*"). Applicants address the rejections as set forth below.

Regarding the Election of Species

The Office Action requested affirmation of the telephonic election of species. Applicants affirm the election, made without traverse, of Species I (claims 1-12) and generic claim 13 for examination. Claims 14-22 are withdrawn.

Rejection of claims 1, 2, 4, 5, and 7-13 under 35 U.S.C. § 103(a)

Applicants traverse the rejection of claims 1, 2, 4, 5, and 7-13 under 35 U.S.C. § 103(a) because a *prima facie* case of obviousness has not been established based on *Friedman* and *Atchison*. To establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a), each of three requirements must be met. First, the references, taken alone or in combination, must teach or suggest each and every element recited in the claims. See M.P.E.P. § 2143.03 (8th ed. 2001).

[1] The Office Action contains a number of statements reflecting characterizations of the related art and the claims. Regardless of whether or not any such statement is identified herein, Applicants decline to automatically subscribe to any statement or characterization in the Office Action.

Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references in a manner resulting in the claimed invention. Third, a reasonable expectation of success must exist. Moreover, each of these requirements must "be found in the prior art, and not be based on applicant's disclosure." M.P.E.P. § 2143 (8th ed. 2001).

A *prima facie* case of obviousness has not been established because, among other things, the relied-upon references fail to teach or suggest each and every element recited in Applicants' claims.

Independent claim 1 recites a method including:

> calculating a frequency distribution of the imperfect entities in unit cells divided from the search target;
>
> approximating the frequency distribution by overlaying at least two discrete distribution functions; and
>
> searching for clustering imperfect entities according to weights of the discrete distribution functions on the frequency distribution.

Friedman is directed to "characterizing the sources of defects (i.e., failed circuits) associated with a batch of semiconductor wafers" (col. 1, lines 65-68; *see* Abstract). *Friedman* does not teach or suggest at least "searching for clustering imperfect entities according to weights of the discrete distribution functions on the frequency distribution," as claimed. As the Examiner notes (OA at 4), *Friedman* discloses a "smoothing and thresholding" process, in which "the weighted number of defects" are computed and the weighted average is transformed (col. 4, lines 30-35; Fig. 6, step 22; Fig. 7, steps 24, 26). *Friedman*, however, does not compute the weights of discrete distribution functions which divide the frequency distribution. *Friedman*, thus, fails to teach or suggest at least the "searching" recited in claim 1.

Moreover, as affirmed by the Examiner (OA at 4) *Friedman* fails to disclose "calculating a frequency distribution of the imperfect entities in unit cells divided from the search target" and "approximating the frequency distribution by overlaying at least two discrete distribution functions," as recited in claim 1.

Atchison fails to cure *Friedman*'s deficiencies. *Atchison* is directed to "improving yield management of semiconductors being inspected for defects" (Abstract). *Atchison* fails to teach or suggest at least "approximating the frequency distribution by overlaying at least two discrete distribution functions," as recited in claim 1. As noted by the Examiner (OA at 4), *Atchison* mentions that "killer probabilities for various classifications of defects are determined by overlaying the defect maps with wafer probe bin maps" (col. 9, lines 38-41). The defect maps and wafer probe bin maps of *Atchison* correspond to actual defects detected during inspection of different layers in the semiconductor wafer (*See*, e.g., col. 5, lines 35-52). In contrast, claim 1 recites "approximating the frequency distribution by overlaying at least two discrete distribution functions ... and searching for clustering imperfect entities according to weights of the discrete distribution functions on the frequency distribution." According to claim 1, the frequency distribution of imperfect entities occurring in the search target is divided into discrete distribution functions, and the "at least two discrete distribution functions" are approximating functions that may classify actual imperfect entities of the frequency distribution into random imperfect entities and clustering imperfect entities, respectively. The "defect maps" and "wafer probe bin maps" of *Atchison* are not consistent with the "discrete distribution functions" recited in claim 1. For at least these reasons, *Atchison* fails to teach or suggest at least the "approximating" recited in claim 1.

Accordingly, neither *Friedman* nor *Atchison*, nor a combination thereof, teaches or suggests each and every element recited in claim 1. A *prima facie* case of obviousness has not been established for at least this reason.

Moreover, *prima facie* obviousness has not been established at least because the requisite motivation to combine is lacking. Determinations of *prima facie* obviousness must be supported by a finding of "substantial evidence." *See In re Zurko*, 258 F.3d 1379, 1386 (Fed. Cir. 2001). Specifically, unless "substantial evidence" found in the record supports the factual determinations central to the issue of patentability, including motivation and expectation of success, the rejection is improper and should be withdrawn.

In this case, there is no "substantial evidence" in the record to support the attempted combination of *Friedman* and *Atchison*, and the requisite "clear and particular" motivation to support a *prima facie* case of obviousness is lacking. The Examiner does not show, by substantial evidence, that a skilled artisan having the cited references before him would have been motivated to combine those references in the manner resulting in Applicants' claimed combination. The Examiner merely provides a general description of how *Atchison* allegedly teaches certain features and fails to provide a proper motive for combining that reference with *Friedman*. The Examiner alleged (OA at 4):

> It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Friedman to include the teachings of Atchison because calculating a frequency distribution would have allowed the skilled artisan to prioritize the various defects according to limits (see Atchison, column 9 lines 41-43).

These conclusory statements in the Office Action are not properly supported and do not evidence that a skilled artisan would have been motivated to combine the references in a manner resulting in Applicants' claimed combination. The Examiner fails to show that either of the relied-upon

references suggests combing their teachings to "prioritize ... defects according to limits." The cited portion of *Atchison*, which merely mentions that "projects are prioritized according to yield limit ...," does not evidence that a skilled artisan would have combined the references as alleged. Further, the Examiner provides no explanation on the record, beyond conjecture, to support the allegation that "calculating a frequency distribution would have allowed the skilled artisan to prioritize the various defects according to limits."

Applicants call attention to M.P.E.P. § 2143.01, which makes clear that

> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination (citations omitted).

The Examiner does not show that the cited art "suggests the desirability of the" combination. No objective reason for combining the applied art to achieve the invention defined by claim 1 has been established.

Applicants note that the requirements for establishing *prima facie* obviousness must "be found in the prior art, and not be based on applicant's disclosure." M.P.E.P. § 2143 (8th ed. 2001). As M.P.E.P. § 2142 articulates:

> Knowledge of applicant's disclosure must be put aside.... [I]mpermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

Applicants submit that the conclusions in the Office Action were not reached based on facts gleaned from the references and that, instead, Applicants' claims were improperly used to reconstruct the prior art. A skilled artisan would not have been motivated, without consulting Applicants' disclosure, to combine *Friedman* and *Atchison* in a manner resulting in the invention defined by claim 1. *Friedman* is directed to characterizing failed circuits associated with a batch

of semiconductor wafers, and *Atchison* is directed to improving yield management of semiconductors being inspected for defects. Neither *Friedman* nor *Atchison*, however, teaches or suggests combining their respective teachings as alleged in the Office Action. Consequently, the conclusions in the Office Action constitute improper hindsight reasoning. Further, because the cited references fail to teach or suggest combining their teachings in a manner resulting in the invention defined by claim 1, realization of Applicants' claimed invention using the cited references requires improper reliance on aspects related to the present invention.

For at least the reasons advanced above, the requisite motivation to combine is lacking. Moreover, the Examiner has not shown, by substantial evidence, that there is a reasonable expectation of success in combining *Friedman* and *Atchison*.

Because the required motivation to combine the applied references is lacking, and since the applied references (even if combined) fail to teach or suggest each and every claim recitation, *prima facie* obviousness has not been established with respect to claim 1. The rejection of claim 1 under 35 U.S.C. § 103(a) should therefore be withdrawn.

Independent claims 10 and 13, although of different scope, recited subject matter similar to that recited in claim discussed above. Claim 10 recites, *inter alia*:

> a frequency distribution calculator calculating, according to the entered data, a frequency distribution of the imperfect entities in unit cells divided from the search target;
>
> a discrete distribution function calculator approximating the frequency distribution by overlaying at least two discrete distribution functions; and
>
> a clustering faults searcher searching for clustering imperfect entities according to weights of the discrete distribution functions on the frequency distribution.

And claim 13 recites, in part:

> calculating a frequency distribution of the imperfect entities in unit cells divided from the search target;
>
> approximating the frequency distribution by overlaying at least two discrete distribution functions; and
>
> searching for clustering imperfect entities according to weights of the discrete distribution functions on the frequency distribution

For at least the reasons presented above in connection with claim 1, *prima facie* obviousness has not been established with respect to claims 10 and 13.

Because *prima facie* obviousness has not be established, the rejection of independent claims 1, 10, and 13 under 35 U.S.C. § 103(a) should be withdrawn. The rejection of claims 2, 4, 5, 7-9, 11, and 12 should be withdrawn as well, at least because of the respective dependence of those claims from base claims 1 and 10. Accordingly, Applicants requests withdrawal of the rejection of claims 1, 2, 4, 5, and 7-13 under 35 U.S.C. §103(a) and the timely allowance of these pending claims.

Rejection of claims 3 and 6 under 35 U.S.C. § 103(a)

Applicants traverse the rejection of claims 3 and 6 under 35 U.S.C. § 103(a) because a *prima facie* case of obviousness has not been established based on *Friedman*, *Atchison*, and *Ikota*.

Initially, Applicants point out an ambiguity in the Office Action. The Examiner acknowledges that *Friedman* fails to disclose that "the discrete distribution functions include a Poisson distribution and a negative binomial distribution," as recited in each of claims 3 and 6. The Examiner then alleges that *Atchison* teaches this claimed feature, but the Examiner cites *Ikota* to support that allegation and further alleges that it would have been obvious to combine *Friedman*, *Atchison*, and *Ikota*. Accordingly, the application of *Atchison* and *Ikota* to claims 3

and 6 is unclear. While it appears the Examiner is relying on *Ikota* as allegedly teaching that "the discrete distribution functions include a Poisson distribution and a negative binomial distribution," Applicants cannot discern from the Office Action how the Examiner is applying *Atchison* to claims 3 and 6. Because the Examiner alleges a combination of *Friedman*, *Atchison*, and *Ikota*, Applicants assume the Examiner is relying on *Ikota* in an attempt to cure a deficiency in both *Friedman* and *Atchison*. Should the Examiner continue to dispute the patentability of the pending claims, however, Applicants request clarification in the next Action as to the grounds for rejection. The ambiguity in the Office Action notwithstanding, Applicants request withdrawal of the rejection of claims 3 and 6 for the reasons discussed below.

Claim 3 depends from base claim 1 and therefore includes all of the features recited in base claim 1. As explained above, neither *Friedman* nor *Atchison*, nor a combination thereof, teaches or suggests at least the "approximating" recited in claim 1 and also required by claim 3. *Ikota*, moreover, does not cure the deficiencies of *Friedman* and *Atchison*. *Ikota* describes a "method for discrimination of clustered defects" (Abstract). *Ikota* does not, however, disclose "approximating the frequency distribution [of the imperfect entities] by overlaying at least two discrete distribution functions," as recited in claims 3 and 6. Accordingly, Applicants submit that neither *Friedman*, *Atchison*, nor *Ikota*, nor any combination thereof, teaches or suggests each and every feature recited in claims 3 and 6. A *prima facie* case of obviousness has not been established for at least this reason.

Even if all of the features recited in claims 3 and 6 could be found in some combination of *Friedman*, *Atchison*, and *Ikota*—to which Applicants do not acquiesce—a *prima facie* case of obviousness has not been established at least because the requisite motivation to combine is lacking. For at least the reasons presented above, there is no motivation to combine *Friedman*

and *Atchison*. In addition, Applicants submit that there is no "substantial evidence" or "clear and particular" motivation in the record to support the attempted combination of *Friedman*, *Atchison*, and *Ikota*. The Examiner does not show, by substantial evidence, that a skilled artisan having the cited references before him would have been motivated to combine the references in the manner resulting in Applicants' claimed combination. The Examiner merely provides a general assertion that *Ikota* allegedly teaches certain features and fails to provide a proper motive for combining that reference with *Friedman* or *Atchison*. The Examiner alleges (OA at 7, 8):

> It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Friedman and Atchison to include the teachings of Ikota because a Poisson distribution would have allowed the skilled artisan to obtain a distribution most equivalent to the real data (see Ikota, page 53, "Conclusions", lines 2-3).

This conclusion does not establish that a skilled artisan would have been motivated to combine the references in a manner resulting in Applicants' claimed combination. The Examiner, for example, provides no evidence to show that a Poisson distribution would in fact provide "a distribution most equivalent to the real data" in the alleged *Friedman-Atchison-Ikota* combination. Regardless, the mention of a Poisson distribution being almost equivalent to real data does not establish that a skilled artisan would have been motivated to combine the references in a manner resulting in the invention defined by claim 3 or claim 6.

Applicants submit that the conclusions in the Office Action were not reached based on facts gleaned from the references and Applicants' claims were improperly used to reconstruct the prior art. *Friedman* is directed to characterizing failed circuits associated with a batch of semiconductor wafers; *Atchison* is directed to improving yield management of semiconductors being inspected for defects; and *Ikota* mentions discriminating clustered defects. Neither of these references, however, teaches or suggests combining their respective teachings as alleged in

the Office Action. Consequently, the conclusions in the Office Action constitute improper hindsight reasoning and the requisite motivation to combine is therefore lacking. Further, because the cited references fail to teach or suggest combining their teachings in a manner resulting in the invention defined by claim 3 or claim 6, realization of Applicants' claimed invention using the cited references requires improper reliance on aspects related to the present invention.

For at least the reasons advanced above, a *prima facie* case of obviousness has not been established with respect to claims 3 and 6. Because *prima facie* obviousness has not be established, the rejection of claims 3 and 6 under 35 U.S.C. § 103(a) should be withdrawn. Applicants therefore request withdrawal of the rejection of claims 3 and 6 under 35 U.S.C. §103(a) and the timely allowance of these pending claims.

New claims 23 and 24

New independent claim 23 recites a method comprising:

> calculating a frequency distribution of the imperfect entities in unit cells divided from the search target;
>
> dividing the frequency distribution into at least two discrete distribution functions; and
>
> searching for clustering imperfect entities according to weights of the discrete distribution functions on the frequency distribution.

Applicants submit that *Friedman*, *Atchison*, and *Ikota*, either taken alone or in any combination, fail to teach or suggest all of the features recited in new claim 23. Applicants therefore request the timely allowance of this new independent claim.

New claim 24 depends from claim 23 and therefore includes all of the features recited in claim 23. Claim 24 further recites, *inter alia*:

> ... wherein the at least two discrete distribution functions approximate the imperfect entities randomly occurring in the

search target and the clustering imperfect entities caused by a specific reason in the search target, respectively.

Applicants submit that *Friedman*, *Atchison*, and *Ikota*, either taken alone or in any combination, fail to teach or suggest each and every feature recited in new claim 24. Applicants thus request the timely allowance of this new claim.

Conclusion

Applicants submit that the claimed invention is neither anticipated nor rendered obvious in view of the references cited against this application. Applicants request the Examiner's reconsideration of the application, in view of the remarks presented herein, and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: May 20, 2004

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